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Planck intermediate results: XXXI. Microwave survey of Galactic supernova remnants

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Abstract

© ESO, 2016.The all-sky Planck survey in 9 frequency bands was used to search for emission from all 274 known Galactic supernova remnants. Of these, 16 were detected in at least two Planck frequencies. The radio-through-microwave spectral energy distributions were compiled to determine the mechanism for microwave emission. In only one case, IC 443, is there high-frequency emission clearly from dust associated with the supernova remnant. In all cases, the low-frequency emission is from synchrotron radiation. As predicted for a population of relativistic particles with energy distribution that extends continuously to high energies, a single power law is evident for many sources, including the Crab and PKS 1209-51/52. A decrease in flux density relative to the extrapolation of radio emission is evident in several sources. Their spectral energy distributions can be approximated as broken power laws, $S\nu \propto \nu^{-\alpha}$, with the spectral index, α, increasing by 0.5-1 above a break frequency in the range 10-60 GHz. The break could be due to synchrotron losses.

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Keywords

cosmic rays, ISM: supernova remnants, radio continuum: ISM